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14. ABSTRACT

Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.

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PROJECT CHECO SOUTHEAST ASIA REPORT

SOUTHEAST ASIA TACTICAL DATA SYSTEMS INTERFACE (U)

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PROJECT

Contemporary
Historical
Examination of
Current
Operations
REPORT

SOUTHEAST ASIA TACTICAL DATA SYSTEMS INTERFACE (U)

1 JANUARY 1975

CHECO/CORONA HARVEST DIVISION
OPERATIONS ANALYSIS OFFICE
HQ PACAF

Prepared by:
Captain Frank M. MACHOVEC
Project CHECO 7th AF

[redacted]

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
APO SAN FRANCISCO 96553

PROJECT CHECO REPORTS

The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that, as a priority, must be collected, documented, and analyzed as to current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely and analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7/13AF, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. It is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM when used in proper context. The reader must view the study in relation to the events and circumstances at the time of its preparation--recognizing that it was prepared on a contemporary basis which restricted perspective and that the author's research was limited to records available within his local headquarters area.

Robert E. Hiller

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REPLY TO ATTN OF OA

20 October 1975

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FOR THE COMMANDER IN CHIEF

Robert E. Hiller

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Capt Frank M. Machovec served his first two and one-half years on active duty with the Air Weather Service; he was later transferred to the USAF Academy Preparatory School where he taught mathematics for two and one-half years. Capt Machovec was selected as the USAF Academy's Junior Officer of the Year for 1972. Prior to joining CHECO, he attended the Squadron Officer School.

The author holds an M.A. in Economics from Denver University; an article which he wrote appeared in the 1972 issue of the Intermountain Economic Review. Upon completing his tour in Southeast Asia, Capt Machovec entered the Management Analysis Career Field.

FOREWORD (U)

(U) The purpose of this CHECO report is to explore the most sophisticated means of interservice coordination yet employed in combat operations: The Southeast Asia Tactical Data Systems Interface. The Tactical Data Systems Interface was the computerized bond between the three tactical data systems in Southeast Asia, and, as such, it was a unique experiment in the control of airpower. For the first time, the tactical data systems of the Air Force, Navy, and Marine Corps were linked to exchange significant information almost instantaneously.* As a result, the control center's Battle Commander had access to a near real time** display of air data, which proved of immeasurable value to combat air operations in Southeast Asia from 1968 to 1973.

(U) When this report was prepared, most of the senior Seventh Air Force personnel who were experienced and knowledgeable regarding the interface were no longer in Southeast Asia, thus precluding interviews with key staff officers. Reliance was therefore placed on the numerous messages, letters, and unit working papers available on microfilm. However, CHECO's microfilm library does not contain a complete picture of

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*(TS) The need for effective, prompt interservice communications during hostilities had clearly been demonstrated during the seizure by the North Koreans of the USS Pueblo on 23 January 1968. The lack of rapid coordination between Naval forces in Japan and Pacific Air Forces in Hawaii caused the forfeiture of 40 minutes of critical reaction time.[1]

**(U) If information can be exchanged between point A and point B instantaneously, then the transfer is said to be accomplished in real time. "Near real time," then, suggests an almost-instantaneous updating of information.

a subject as far-reaching as the Tactical Data Systems Interface. Consequently, it should be emphasized that this monograph is not a final report. This document provides a starting point for exploring the story of the USAF's role in the Tactical Data Systems Interface, but the reader should recognize that future research will produce data which may yield new perspectives on this subject.

(U) This report is in five parts. Chapter I identifies the specific problems which led first to the automation of the Air Force's tactical control and reporting procedures, and eventually to the interfacing of the tactical data systems of the Air Force, Navy, and Marine Corps. Chapter II enumerates the input/output modes of the entire interface operation. Discussed in Chapter III are the unsuccessful attempts in 1970 and 1971 to convert the Interface from an automated to a manual system. Cahpter IV reviews the serious problem areas which surfaced during the operation of the Interface, while Chapter V chronicles its positive contributions to air operations in Southeast Asia thereby underscoring the enormous value of the triservice interaction which it afforded.

CHAPTER I

EARLY DEVELOPMENTS WHICH ULTIMATELY LED TO THE TACTICAL DATA SYSTEMS INTERFACE (U)

(U) The automation and subsequent interfacing of the tactical data systems in Southeast Asia (SEA) evolved from the attempts to solve the problems which began to undermine US air efforts in 1966. Foremost among the areas of difficulty were the compilation of enormous amounts of data for reports to higher headquarters and the command and control of US aircraft.

(U) The task of maintaining sound reporting procedures became increasingly burdensome as the tempo of air operations was stepped up in the mid-sixties. For example, Operations Reports (such as the OPREP-4) had to be filed on all strike and reconnaissance sorties. An OPREP-4 was basically a description of the mission, including the geographic area and mission results. By late 1967, the USAF was flying a monthly average of 35,000 sorties, creating an inordinately heavy workload in completion of fragmentary orders and Operations Reports. Consequently, in June 1967 Seventh Air Force began converting its combat air reporting procedures from manual to automatic processing. The new system for data storage and reporting was called Seek Data I and employed the IBM 1410 Computer. Computerization significantly improved the submission of post-strike analyses to Headquarters, Pacific Air Forces (HQ PACAF). For example, in the last quarter of 1967 PACAF "noted the near perfect (99.6%) receipt of approximately 12,000 OPREP-4

reports....This is in contrast to approximately 65% that were received at HQ PACAF under previous methods and procedures."[2] But reporting requirements continued to mount and the IBM 1410 soon became inadequate. Early in 1968 Seventh Air Force purchased an IBM 360 computer to replace the IBM 1410. Upon the installation of the new computer the data storage and reporting system became known as Seek Data II and the problems of data storage and reporting were finally arrested.[3]

(S) Seek Data II was also the inception of an automated approach to the entire operational environment, including system reporting, mission planning, and airlift management.[4] Seek Data II was needed because by the mid-1960s command and control of US aircraft throughout SEA had become a complicated problem. At that time the United States maintained a diverse air armada in SEA, comprised of three components (Air Force, Navy, and Marine Corps), all operating "in-country" in the confined airspace of South Vietnam. The multiplicity of fixed-wing aircraft, employed in a variety of roles, caused tremendous problems for flight planners and weapons controllers. There were hundreds of Air Force/Navy/Marine tactical fighter-bombers and associated refueling aircraft operating in SEA simultaneously; there were also reconnaissance aircraft, gunships, and various tactical airlift aircraft. There were also many strike and strike-support aircraft operating over North Vietnam (NVN) where, in addition to the normal command and control problems which could be expected under such circumstances, delicate political problems also arose over the possibility of inadvertent penetration of the border of the People's Republic of China (PRC).

(S) Although Seek Data II helped to alleviate the problems associated with in-country air operations, the more serious question of command and control of out-country US aircraft was yet to be resolved. Underscoring the need to closely monitor US forces operating over North Vietnam were two PRC border violations in 1966. On 12 May 1966 an EB-66* and its fighter cover of F-4s strayed across the PRC border, at which time a Chinese MiG was engaged and shot down, resulting in a serious warning from Peking to the US Government. After an investigation by the Joint Chiefs of Staff, the Air Force was tasked to prevent further incidents by establishing a facility for positive control of US forces over North Vietnam. A second overflight of the PRC by an EB-66 and its F-4 escorts on 29 June 1966 further highlighted the need to rapidly establish a positive control center.[5] Consequently, on 15 July 1966, the USAF established an independent warning facility in the Panama Control and Reporting Center (CRC) atop Monkey Mountain, South Vietnam. Thus a new system, named Combat Lightning, was born.[6]

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*(S) The EB-66 aircraft used electronic countermeasures to degrade or negate enemy radar systems such as early warning, ground control intercept, anti-aircraft artillery, surface-to-air missiles, and airborne intercept.

CHAPTER II

INPUT/OUTPUT MODES OF THE TDS INTERFACE (U)

Air Force Input: Combat Lightning and the TACC-NS (U)

(S) Combat Lightning was "an automated tactical air management system primarily concerned with monitoring out-country air operations."[7] Completed in three phases between 1966 and 1968, the Combat Lightning System entailed the expansion and eventual computerization of the out-country command and control capabilities of the Air Force.[8] The temporary Phase I warning facility established at the Panama CRC in July 1966 quickly gave way to Phase II, an interim Monkey Mountain site completed in November 1966. The Phase II system was manual and it became known as the Tactical Air Control Center-North Sector (TACC-NS), call sign Motel. Phase III, nicknamed Seek Dawn, was the automation of the TACC-NS, but computerization was not effected until December 1967.[9]

(S) From November 1966 to December 1967, the Phase II TACC-NS served as a manual facility. It monitored air operations and issued MiG warnings and PRC border warnings based on data from numerous sources, including the Naval Tactical Data System (TDS) and the long-range radars at Monkey Mountain (Panama CRC) and Udorn Royal Thai Air Force Base (Brigham CRC).[10] The TACC-NS also plotted the airborne radar inputs it received from the College Eye Task Force,[11] which had been in SEA since 1965.* While orbiting over Laos and the Gulf of Tonkin, College Eye

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*(U) For more detailed information on the College Eye Task Force, see the Project CHECO report entitled College Eye (U), 1 Nov 1968 (TS).

EC-121 aircraft*, call sign Disco, were responsible for the issuance of border warnings, the control of interceptors, and the gathering of surveillance data.[12] In addition to College Eye, the TACC-NS was assisted by KC-135 radio relay aircraft,** call sign Luzon, which were used to extend the communications capability of the TACC-NS by passing MiG warnings and PRC border warnings on both secure and non-secure radios.[13]

(S) Throughout 1967 construction of a permanent, automated TACC-NS (Phase III) was carried out at Monkey Mountain. Phase III of Combat Lightning also included construction of an alternate TACC-NS at Udorn Royal Thai Air Force Base (RTAFB).[15] Philco Ford was the prime contractor for the physical layouts,[16] while Systems Development Corporation directed the initial training of personnel for the conversion from a manual to an automated operation.[17] By December 1967, both the TACC-NS and the alternate TACC-NS were equipped with Back-Up Intercept Control (BUIC II) Systems.[18] The two sites were linked, so that either could function independently if the other became inoperative.[19]

(S) Although the Air Force intended the alternate TACC-NS to serve as a viable back-up for the primary TACC-NS, tests conducted by Seventh

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*(U) Supplied and operated by the Air Defense Command.

**(S) Supplied and operated by the Strategic Air Command. These radio relay aircraft were sometimes also used for emergency refuelings; for example, on six occasions between May and August 1972 these K-135 aircraft were vectored by the TACC-NS to fighters who had declared an emergency fuel state.[14]

Air Force in August 1968 revealed that the Udorn site was only marginally capable of communicating with the Navy shipborne radars in the northern Gulf of Tonkin. The radio relay aircraft simply could not effectively broadcast the signals of the alternate TACN-NS over the long distance from Udorn to the northern Gulf of Tonkin.[20] Problems involving radio relay aircraft continued to plague Seek Dawn throughout its lifespan; Chapter III will explore this and other problem areas in more detail.

National Security Agency Input: Iron Horse (U)

(S) To further improve the information available at the TACC-NS an Iron Horse input was added in early 1968.[21] Iron Horse was a computerized system for assimilating and displaying data from Special Intelligence sources. The National Security Agency maintained operational control of the Iron Horse System, but the facilities were manned by personnel from the USAF Security Service. The warning advisory function performed by the TACC-NS was highly dependent upon the information supplied by the Iron Horse computers, which were in place at both Monkey Mountain and Da Nang Air Base, South Vietnam.*[22]

(S) After Iron Horse was integrated into the Combat Lightning System, preparations were made for the computerized link-up between the tactical data systems of the Air Force, Navy, and Marine Corps. This was the ultimate objective of the SEA Tactical Data Systems Interface:

*(S) Da Nang Air Base was located near Monkey Mountain. In April 1971, the Iron Horse facilities at Da Nang were transferred to Ramasun Station, Thailand, 15 miles from Udorn RTAFB.

to obtain a real-time exchange of information between the tactical data systems of the Air Force, Navy, and Marine Corps, all supplemented by the intelligence gathering activities of the National Security Agency. The automated Interface program was tested in the United States during the summer of 1968, and the original target date for implementation was 15 October 1968. However, on 5 October 1968 the computerized link was postponed by the Commander in Chief, Pacific Command (CINCPAC), who felt that the project required further testing and corrections.[23] Several major design changes were subsequently made,[24] and the tri-service Interface began functioning on a completely automated, near-real-time basis on 5 July 1969.[25]

Relationship Between the Air Force Tactical Data System and the Tactical Air Control System (U)

(S) Perhaps at this point it would prove helpful to differentiate between a Tactical Data System and a Tactical Air Control System. Seek Dawn was the nickname for the automated Tactical Data System of the USAF; that is, Seek Dawn was designed to accept, manipulate, and display tactical data. (The Navy and Marine Corps also had automated tactical data systems.) But the Seek Dawn Tactical Data System should not be confused with the standard Air Force Tactical Air Control System, which is a radar network composed of Control and Reporting Centers and Control Reporting Posts (CRPs).[26] The long-range radars at the Panama and Brigham CRCs were configured with "common digitizers," FYQ-40s*,

*(S) Collocated with the two long-range radars was an FYQ-40: a system which converts raw radar impulses into a format that can be transmitted to and understood by the computer, thus the FYQ-40 digitized the radar returns so they could be fed into the computerized BUIC II System.

which supplied real-time data to the Seek Dawn facility -- the Tactical Air Control Center-North Sector -- while other Air Force Tactical Air Control System elements in SEA such as Invert (the Control and Reporting Post at Nakhon Panom RTAFB, Thailand) provided manual inputs to the TACC-NS. The Air Force Tactical Air Control System and the Seek Dawn Tactical Data System were thus complementary in that each supplied useful information to the other. Seek Dawn was highly dependent on radar data, especially from Panama and Brigham CRCs, while the Tactical Air Control System, in turn, employed the valuable threat warnings provided by the Seek Dawn network.[27]

Navy Tactical Data System and the Marine Corps Tactical Data Communications Central (U)

(U) As mentioned previously, the tri-service Interface began functioning on a completely automated basis on 5 July 1969. The Air Force, Navy, and Marine Corps each provided part of the Interface. The Air Force contribution consisted of the extensive Combat Lightning System already described. The Navy's input was derived from the Navy TDS, which was composed of both shipborne and airborne radars and computers. The shipborne facilities were located aboard an aircraft carrier operating in the south central portion of the Gulf of Tonkin, and on guided missile cruisers/destroyers (see Fig 1)* operating in the northern Gulf of Tonkin. The Navy's Airborne TDS was housed in E-2 aircraft, and each Airborne TDS unit received radar and Identification, Friend or Foe inputs from long-range radars. The Navy's Airborne TDS aircraft were therefore

*(S) The USS Long Beach (Fig 1) was one of the several ships that served in this capacity

Figure 1: The USS Long Beach

(This Page is Unclassified)

able to detect, monitor, and report airborne and surface targets to subscribers via an automated computer link.[28]

(S) The Marine Corps tactical air facilities were collocated with the TACC-NS at Monkey Mountain, but the role of the Marines and their equipment was primarily to augment the Tactical Data Systems of the Navy and Air Force. Nevertheless, the contribution of the Marine Corps was both direct and meaningful, for the Marine Tactical Data Communications Central acted as the focal point for the exchange of data between the Air Force and the Navy Tactical Data Systems.[29] The Navy TDS computer and the Air Force Seek Dawn computer "talked" to each other via the Marine Tactical Data Communications Central and Link 11, an automated communications system. The Navy TDS ship, with call sign Red Crown, served as the net control station* for the Link 11 hook-up. The actual exchange of data would begin when the net control station issued a "roll call" for information from all computerized ships and aircraft in the Navy TDS. The automated components then transmitted their data -- one at a time -- to the net control station. (Non-computerized ships supplied data via Link 14, a secure teletype which relayed 100 encrypted words a minute.) In the automated transmission cycle, the net control station would interrogate the Marine Tactical Data Communications Central as a "ship," at which time the Air Force input was passed to the Navy TDS, and vice versa.[30] However, the languages of the Navy's TDS computer and

*(S) The net control station was the ship which served as the focal point of data transfer in the Navy's extensive network of ships and planes.

Seek Dawn's BUIC II Computer were not compatible. Therefore, before the Air Force's data was supplied to the Navy, the output of the BUIC II was converted by the Iron Horse Univac 818 computer into a language which could be understood by the Navy TDS. Similarly, the Univac 818 translated the Navy's input into a format which could be used by Seek Dawn. Thus the Univac 818 acted as an "interpreter," while the Marine Tactical Data Communications Central transmitted the Air Force data to the Navy and received the Navy's input for Seek Dawn.[31]

(S) Finally, in addition to the transfers made through the Tactical Data Communications Central, the TDS Interface possessed an excellent conduit for the exchange of information in plain language. Secure clear voice communications between the Air Force and Navy were accomplished through "Air Force Green," a special radio relay net employing around-the-clock KC-135s from Kadena Air Base, Okinawa. Air Force Green enabled the Air Force and Navy to coordinate information up to and including Top Secret.[32]

(S) Figure 2 provides relative positions of the key facilities of the TDS Interface (Red Crown, the Navy's Airborne TDS, the TACC-NS, etc.). As illustrated in Figures 3 and 4, SEA was divided into two geographical areas of radar responsibility: one for the Air Force and one for the Navy. (The Marine Corps was not assigned a separate geographic area.) For a complete flow chart of the TDS Interface, see Figure 5.

Figure 2: Location of the Key Facilities in the TDS Interface

SOURCES: (a) SEA Air Saturation Follow-up Report, Figure 1, 20 Oct 72.
(b) Naval Tactical Data Systems Report, Figure 2, 9 Apr 71.

The Brigham CRC was located at Udorn RTAFB while both the Invert CRC and the Eaball Weapons Control Center were located at Nakhon Phanom RTAFB.

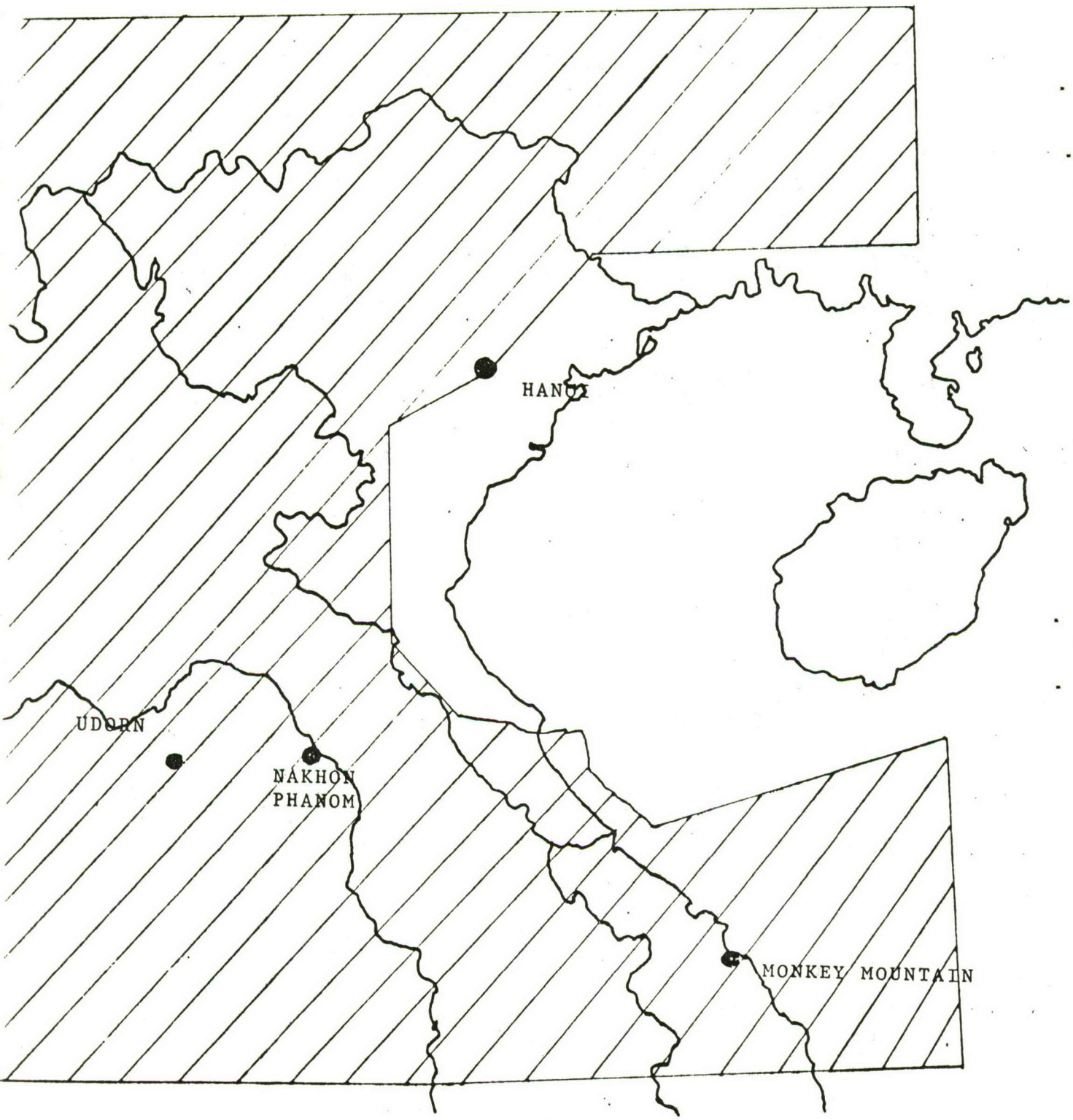


Figure 3: Radar Responsibility of the Air Force

SOURCE: SEA TDS Interface Operations Plan #586-70, 1 Feb 1970

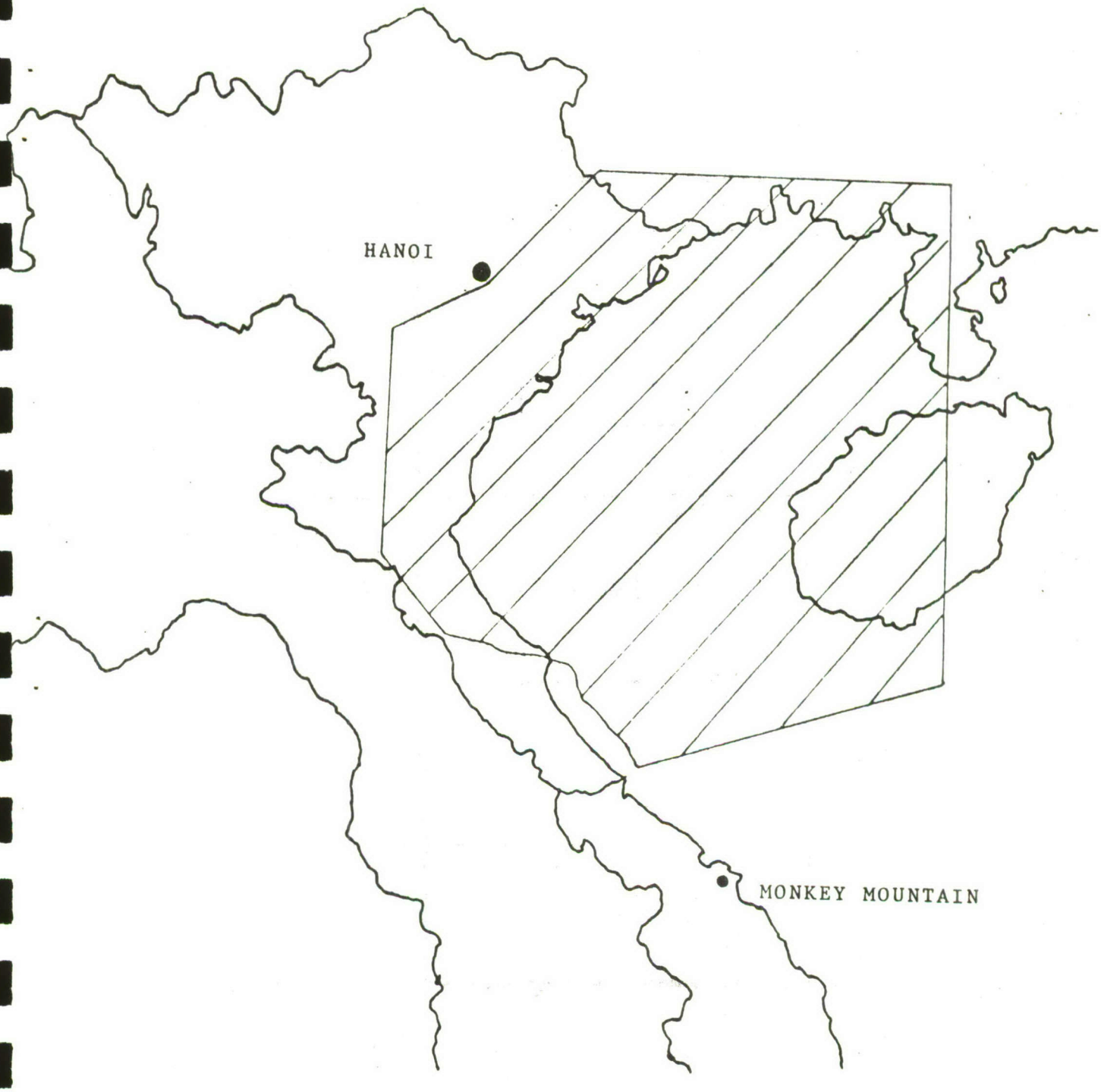
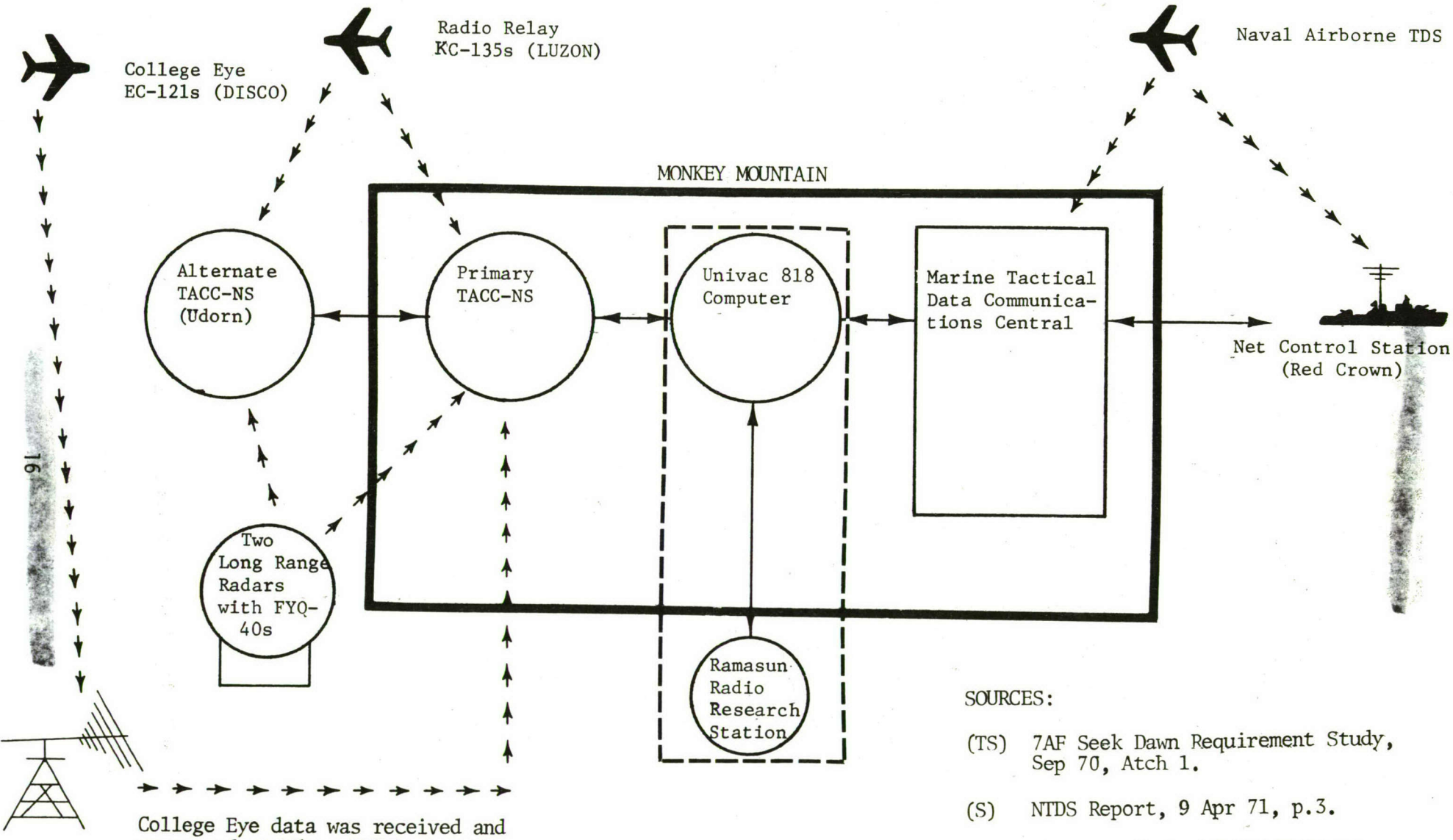


Figure 4: Radar Responsibility of the Navy

SOURCE: SEA TDS Interface Operations Plan #586-70, 1 Feb 1970



SOURCES:

(TS) 7AF Seek Dawn Requirement Study, Sep 70, Atch 1.

(S) NTDS Report, 9 Apr 71, p.3.

(S) Minutes of the EC-121/TACC-NS Digital Link Conference, 27 Jan 72, p.1.

Figure 5: Flow Chart of the SEA TDS Interface (1972)

Capabilities of the BUIC II System's GSA-51 Computer (U)

(S) The TACC-NS computers insured that tactical data support to the disparate air elements in SEA was both instantaneous and dependable. Data was fed into the BUIC II system at Monkey Mountain from all of the sub-systems of the Interface, at which time the inputs were processed by the BUIC's GSA-51 Computer. The GSA-51 (manufactured by the Burroughs Corp) had the capability to accept digital inputs from as many as five radars,[33] but only two radars were configured with the FYQ-40: Monkey Mountain's Panama and Udorn's Brigham. Thus, Seek Dawn could have been enhanced by real-time inputs from additional radars. For example, automated data from Nakhon Phanom's Invert CRP, which supplied radar coverage for part of Laos, would have been especially helpful. In fact, a potentially successful MiG engagement had to be broken off because the TACC-NS was unable to correlate Invert's manual track data with Seek Dawn's GSA-51 track data.[34] Partly as a result of this incident, Air Force Systems Command conducted a study in May 1971 which concluded that a near real time exchange between Invert and the TACC-NS was possible;[35] furthermore, the establishment of such a link was recommended to Seventh Air Force in December 1971 by the Commander of the 505th Tactical Control Group.[36] However, an automated link between Invert and Motel was never consummated.

(S) The storage and replay capabilities of the BUIC II system proved especially useful. The GSA-51 computer could store information on 320 aircraft tracks while simultaneously displaying 120 tracks on

its consoles, thereby presenting the entire air situation to the TACC-NS Battle Commander.[37] For example, information concerning the flight or intended flight of MiG aircraft was used to withdraw slow-moving planes from threatened areas,[38] thus helping to prevent EC-121 type Korean incidents in SEA.[39] (On 15 April 1971, a Navy EC-121 with 31 crew-members was shot down off the coast of North Korea while on a reconnaissance mission.[40]) Another valuable dimension of the GSA-51 was its ability to reconstruct track histories. This replay capacity was particularly useful for reviewing special tactical operations and determining the probable locations of downed aircrews.[41] Although the Interface possessed numerous worthwhile capabilities, the seemingly permanent drawdown of the war after 1969 led the Air Force to begin seriously questioning whether the benefits of the automated Interface could be justified, considering its unusually high costs.

CHAPTER III

ATTEMPTS TO CLOSE THE INTERFACE (U)

First Closure Attempt (September 1970) (U)

(TS) During his visit to SEA in August 1970, General John D. Ryan, Air Force Chief of Staff, tasked Seventh Air Force to evaluate the need for a fully automated facility like the TACC-NS.[42] After completing an in-house study in September 1970, Seventh Air Force recommended that the alternate TACC-NS at Udorn be phased out because the primary TACC-NS at Monkey Mountain was 90% reliable even without a back-up site. Seventh Air Force also recommended, as a cost-savings measure, that the primary TACC-NS should be gradually de-automated.[43] These recommendations were based on the realities faced during the summer of 1970, when it appeared that a continued drawdown of the war was almost a foregone conclusion. In fact, the first assumption listed by Seventh Air Force in their September 1970 study was that "the air war over North Vietnam has been terminated, and in all likelihood will not be resumed."[44] Consequently, the alternate TACC-NS at Udorn was closed on 31 December 1970.[45] However, despite the support of the Commander in Chief, PACAF (CINCPACAF),[46] the plans of Seventh Air Force to de-automate the TACC-NS failed to win unqualified endorsements from either the Marines or the Navy.

(S) The Commanding General of the Third Marine Amphibious Force noted:

> ...if the air war over NVN has been terminated.... then the manual system could assume most of the automated functions. Should these premises be faulty, the [7AF Seek Dawn] study cannot be concurred in.[47]

(TS) The Commander of Carrier Task Force 77 also questioned Air Force plans to de-automate the Interface. The Navy wanted a computerized link "as long as air operations (were) being conducted to any significant degree over North Vietnam, northern South Vietnam, the Gulf of Tonkin, and...Laos."[48] Seventh Air Force felt that the reaction time lost by de-automating would not seriously degrade the warning mission of the TACC-NS,[49] but the Navy disagreed:

> ...The time from detection of a threat situation to reaction is significantly less in the present SEA TDS Interface than in any manual Interface. This time savings could result in saving a multi-million dollar aircraft or a US aircrew.[50]

(TS) Another pertinent consideration brought up by the Navy was the unusual experimental value of the automated Interface:

> ...the SEA TDS Interface is the only operational joint-service, computerized interface now in existence. The lessons learned from the continued employment of this system are important, and directly applicable to the future establishment of effective interfaces in other areas.[51]

(TS) Finally, General Creighton W. Abrams, the Commander of the United States Military Assistance Command, Vietnam, was asked for his views on the 7AF proposal. General Abrams generally supported the Navy assessment, and he offered the following comment in a message to CINCPAC:

> ...the advantages of the existing automated system in track handling capacity and overall reduction in elapsed time from detection through reporting, display, and evaluation, strongly militate against the acceptance of any lesser capability.[52]

(TS) The arguments against the Seventh Air Force proposal finally prevailed when, in November 1970, CINCPAC adopted the position that the automated Tactical Data Systems Interface should be retained as long as significant US air operations were being conducted in SEA.[53]

(TS) One remaining relevant aspect of the de-automation controversy has yet to be explored. Was it possible that General Ryan's original inquiry about the expense of the Interface was misconstrued by Seventh Air Force, thus creating an atmosphere in which Seventh Air Force felt it necessary to produce a study which supported de-automation? In a letter of 4 September 1970 to the Military Assistance Command Vietnam, Major General Ernest C. Hardin, Jr., the Vice Commander of Seventh Air Force, wrote:

> Our reticence in committing additional Air Force funds to the [TDS Interface] has been due to the questions raised by General Ryan as to the continuing requirement for a computerized system...during the present and projected decreasing levels of US activity.[54]

(TS) Moreover, the impressive Seventh Air Force study which prompted CINCPACAF's support in September 1970 had <u>not</u> been embraced by the two key personnel who were directly involved with the Seek Dawn System. Brigadier General Walter T. Galligan, Director of the Seventh Air Force Tactical Air Control Center (Blue Chip), disagreed with those who desired de-automation. In June 1970, he asserted the

continuing need for an automated link between the Navy, Air Force, and Marine Corps:

> (S) The capability that the TDS interface gives should be retained as long as US aircraft have a significant mission or operational responsibility in Southeast Asia. This includes air defense, reconnaissance and other missions that may require border warnings, hostile aircraft warnings, and fighter protection. Experiences in Korea have pointed out that the need for surveillance and quick reaction increases with a decrease in air superiority. The TDS provides real time surveillance data, including USAFSS [USAF Security Service] inputs, and quick reaction time since the computerized information is instantly available.
>
> (TS) According to USAF Program 72-1, Bases, Units and Priorities, dated December, 1969, the USAF have major air units in the Southeast Asia area until 1st Quarter, FY 72. Should the USAF be tasked for air defense beyond this date, strongest consideration should be given to retaining the Tactical Data System. If Navy Tactical Data System cable ships are in the Gulf of Tonkin, the interface should continue in order to provide for a coordinated USAF-USN air defense effort.[55]

(TS) The Director of the Monkey Mountain Operations Center, Colonel William C. Brookbank, also seriously questioned the plans of Seventh Air Force to manualize the TACC-NS. When queried by Seventh Air Force about the proposal to de-automate the Interface, Colonel Brookbank's letter of response of July 1970 contained clear opposition to the idea:

> (TS) ...it is possible that as our tactical air assets reach a strength level comparable to, or less than that of the enemy's, he could at his time and choosing precipitate hostile action which could jeopardize US Forces remaining and very likely create embarrassment to the US Government.

(TS) ...If the proposed phase down of the SEA-TDS [Interface] is based purely on dollar savings, then, in reality, the on-going cost...to maintain and operate Seek Dawn is insignificant when compared to the large amounts already expended in establishing the system to date...it appears both logical and feasible that the system remain status-quo until the last possible moment for maximum security of our remaining forces....

(TS) In summary, the...closure of the TACC-NS is definitely not desirable in view of the limitations this action would impose upon the protection of US Forces in SEA.[56]

Second Closure Attempt (August - September 1971) (U)

(S) The air war continued to decline from November 1970 through the summer of 1971. Especially significant was the 50% reduction in the number of sorties requiring special monitoring by the TACC-NS.[57] Consequently, in August 1971 the Air Force Chief of Staff again asked for an evaluation of the need for an automated versus a manual interface.[58] Seventh Air Force re-studied the problem and recommended that the TACC-NS be closed and the Interface de-automated by May 1972. But soon after the Seventh Air Force Commander approved the study group's recommendations, the North Vietnamese (late in the fall of 1971) began a concerted effort to shoot down American planes in the Laos-Vietnam border areas.[59] By March 1972, MiG incursions into Laos and South Vietnam had risen sevenfold.[60] The September 1971 decision to inactivate the TACC-NS was unexpectedly overtaken by events, which caused Seventh Air Force to reexamine its position. In January 1972, the Seventh Air Force Director of Operations (DO) formally recommended that

the computerized TACC-NS be maintained until April 1973,[61] and plans were executed to reopen the alternate TACC-NS at Udorn as a manual facility by May 1972.[62]

(U) The decisions of 1970 and 1971 to delay dismantling the automated Interface proved wise indeed. The real time MiG warnings provided by the TACC-NS became especially valuable after the MiGs became more aggressive late in 1971. Furthermore, the large-scale resumption of the ground war in the spring of 1972 brought a concomitant rise in the use of US airpower, including the Linebacker I and II campaigns,* which were enhanced by the real-time information supplied by the computers at the TACC-NS.

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*(U) Linebacker I: 10 May - 23 October 1972; Linebacker II: 18-29 December 1972

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CHAPTER IV

PROBLEM AREAS (U)

(U) Any new system, especially one as complex as the TDS Interface, will invariably experience difficulties. Recall from Chapter II that the operations of the USAF's Tactical Air Control System and Tactical Data System were mutually beneficial; consequently, limitations experienced by major elements within the Tactical Air Control System could normally be expected to adversely affect the TACC-NS, which was the heart of the TDS Interface. Therefore, the problems of the USAF Tactical Air Control System cannot be divorced entirely from the problems of the Seek Dawn TDS.

(S) Certain problem areas had begun to surface during periods of peak air traffic in 1972. Evidence of unsatisfactory service included friendly losses to MiGs during the first 90 days of Linebacker I,[63] Hazard Reports filed by KC-135 tanker crews,[64] and various comments from Linebacker I critiques.[65] The degradation of service was induced by a variety of shortcomings, the more important of which involved communications, air traffic control, radar maintenance/logistics, and personnel.

Communications (U)

(S) There were three primary communication problem areas associated with the Interface: communications loss due to natural phenomena, radio relay aircraft outages, and unsuitable handover procedures between Red Crown and Panama.

(S) Meteorological Disturbances. Atmospheric propagation at sunset would sometimes blank out the reception of the transmission from a participating unit in the Link 11 roll call of the Navy TDS. This was called "Link hangup," and when it occurred the net did not progress to the next subscriber. Consequently, there were times when the Tactical Data Communications Central was lost from the link. Frequency shifts would usually correct the difficulty; nevertheless, until shifts were completed, there were temporary periods when the Tactical Data Communications Central was neither receiving nor transmitting any information.[66]

(S) Radio Relay Aircraft Outages. Problems were also experienced with the Luzon radio relay aircraft. When Major General C. M. Talbott, Seventh Air Force DO, attributed the loss of an F-4 in October 1972 to a Luzon outage, the difficulties of the radio relay aircraft were brought to the personal attention of General Ryan.[67] General Ryan reviewed the problem and concluded that the inability of Luzon to make line-of-sight transmissions was largely responsible for the shortcomings.[68] However, General Ryan also felt that the fractionalized approach to communications problems in general was partly responsible for the Luzon situation:

> I cannot find any authoritative person or group who is addressing Linebacker communication on an end-to-end basis. Operations, logistics and communications, Seventh Air Force, Eighth Air Force, and Pacific Communications Area each have a critical piece of the action, but there's no crew chief. I sincerely believe that until you can form a knowledgeable group in the combat theater, with the authority appropriate to the importance of this communication, we will continue to have finger-pointing, confusion and uncertain progress.[69]

In December 1972 the problems of the radio relay aircraft were further compounded by the electronic jamming emissions of the B-52s and EB-66s during Linebacker II operations over NVN.[70] This problem was never completely overcome; the technological limitations of the radio relay hardware continued to plague communications until the end of the combat operations, periodically creating an unavoidable weakness in the Interface system.

(S) Panama - Red Crown Handover Procedure. The third communications problem was the unsuitable handover procedure employed by Panama and Red Crown. Panama and Red Crown made aircraft handovers on an insecure net, which necessitated that the handover be passed cryptographically, which in turn required the encoding and decoding of information. The coding process became burdensome when large volumes of air traffic were involved; therefore, the USAF's 505th Tactical Control Group "requested authorization from the USN to approve use of clear uncoded transmissions in consummating a radar handover from one control agency to another."[71] Although the proposal was initially rejected in the name of security precautions,[72] it was ultimately implemented.

Air Traffic Control (U)

(S) The Development of Teaball. By the end of 1967, the air defense system of NVN had been significantly upgraded with sophisticated Ground Control Intercept systems provided by the Soviet Union. This modernization gave the MiGs a distinct advantage over US aircraft operating deep inside NVN; the radar coverage (and subsequent MiG warning time)

provided to friendly pilots became unsatisfactory.[73] Red Crown furnished excellent radar coverage over the Gulf of Tonkin and the immediately adjacent coastal areas, but the shipborne radars were generally* not effective further inland because of the distance factor. That is, due to Red Crown's line-of-sight problem friendly forces operating inland had little radar protection for altitudes under 10,000 feet.[74] Consequently, USAF performance against MiGs faltered. As General John W. Vogt (former Commander of Seventh Air Force) commented, "The last eight months of Rolling Thunder...cost [the USAF] an airplane almost everytime we went up there." General Vogt further stated that during the second and third months of Linebacker I, "We were losing more airplanes than we were shooting down."[75]

(U) To give US pilots parity with the North Vietnamese Air Defense Network, a weapons control center (with call sign Teaball) was constructed at Nakhon Phanom RTAFB. By August 1972, the new facility, which integrated all available MiG warning information including all source intelligence, was providing real-time MiG warnings to US pilots deep inside NVN. The addition of Teaball produced a dramatic turnabout in the loss ratio of USAF/NVN aircraft. During June and July 1972, the USAF lost three planes for every two MiGs destroyed, but after the introduction of Teaball, USAF losses were reduced to about one plane for every four MiGs shot down.[76]

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*(C) Unless the radars were looking up the Red River Valley painting friendly aircraft over Hanoi or the Red River Delta area.

(S) Although Teaball alleviated the problem of losses to MiGs, the larger problem of saturation of friendly airspace continued to hamper US air traffic control facilities. The stepped-up tempo of air operations during Linebacker operations highlighted the pressing urgency of the limited airspace problem, as was indicated in the following introductory passage of a PACAF report:

> During May [1972] Seventh Air Force expressed concern over the increasing mid-air collision potential within SEA...and identified an immediate need to implement actions which would reduce the hazardous situation. As a result, two conferences were chaired by HQ PACAF [in June 1972] to identify deficient areas contributing to the hazardous conditions and propose recommendations which would minimize the mid-air collision potential.[77]

As a result of the June 1972 conferences, PACAF conducted a survey in July 1972 to determine the effectiveness and adequacy of control procedures, equipment, and personnel in SEA. Furthermore, CINCPACAF directed the PACAF investigators to make another visit in the fall of 1972 to insure that the recommendations offered in July 1972 were being implemented.[78]

(S) Coordination Problems Between the TACC-NS and the 7AF Tactical Air Control Center. Part of the difficulties encountered in air traffic control were attributed to the coordination problems which developed between the TACC-NS and the Seventh Air Force Control Center (Blue Chip). PACAF's inspectors found that the TACC-NS was experiencing fragmentary order inconsistencies and conflicting instructions from Blue Chip.[79] Some of the pointed comments recorded by the TACC-NS Battle Commanders reflect the occasional lack of coordination which

occurred during the spring and summer of 1972. For example, during a 30 June Search and Rescue effort the Search and Rescue Airborne Command and Control Center (call sign King) requested a withhold on the survivor pickup, but Blue Chip procrastinated in giving King an answer. Thus the TACC-NS directed King to make a decision without waiting for Blue Chip's response. The TACC-NS Battle Commander's personal opinion was as follows:

> Blue Chip...appeared to be in a state of confusion and couldn't provide Motel and Panama with any guidance. It is extremely difficult to communicate with higher echelons of command when they won't even answer their phones.[80]

Another example of coordination problems was the postponement of the scheduled time over target (TOT) of a 2 July 1972 TACAIR mission. Again, the TACC-NS Battle Commander was disturbed:

> ...Original TOT was 1152Z, but Motel received no notification from Blue Chip of the 10-minute delay in TOT. Sure would be nice to receive the necessary information to do our job properly.[81]

The emotional remarks above (plus several others recorded between May and August 1972) illustrate the strained relationship which developed for a brief time between Blue Chip and Motel. The problem was apparently resolved through the implementation of the PACAF survey team's recommendations; after September 1972, the TACC-NS Battle Commanders' Logs were devoid of derogatory comments about Blue Chip.*

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*(U) Unfortunately, the Blue Chip Staff Duty Officer Logs were unavailable for research for this study.

(S) The Seek View subsystem, which was originally planned as part of the Interface network, may have helped prevent the coordination friction discussed above. Seek View was to be a semi-automatic system which would have presented the Seventh Air Force command staff at Blue Chip with a near real time display of the air situation carried at the TACC-NS. Seventh Air Force had intended to install a Seek View console no later than January 1970, but after the level of hostilities abruptly subsided in 1968, the Seventh Air Force Commander recommended that the plans for Seek View be terminated. The Air Force Chief of Staff concurred, and Seek View was cancelled on 27 September 1968.[82] Although the Seek View concept was briefly resurrected in the fall of 1970, the plans were again dismissed by Seventh Air Force, which advised CINCPACAF that the cost was "prohibitive in view of the probable limited time the requirement will exist."[83]

(S) Would the presence of a general officer in the TACC-NS have minimized the Motel/Blue Chip coordination problem? For example, from 26 to 30 December 1971, during the Proud Deep Alpha* strikes against North Vietnam, Brigadier General Richard H. Cross, 7AF/DO, participated at the TACC-NS as a coordinator with Blue Chip.[84] But no general officer filled a similar role during the massive Linebacker I or Linebacker II campaigns. Informal conversations with several officers who served at Monkey Mountain revealed their belief that a first-hand

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*(S) Proud Deep Alpha was a specially authorized, short duration air operation against selected military targets in southern North Vietnam. For more detailed information, see the Top Secret Project CHECO report entitled Proud Deep Alpha, 20 July 1972.

viewing by a general officer of all the data available at the TACC-NS would have precluded most of the coordination friction which developed between Motel and Blue Chip.

Radar Maintenance/Logistics (U)

(S) Effective radar maintenance was a natural area of concern. In June 1972 a special evaluation of Panama discovered marginal equipment performance, yet a September 1972 PACAF survey team found that the deficiencies listed the previous June had gone largely uncorrected.[85] PACAF noted, for example, that eight search radar discrepancies existed during both the June and September visits.[86] PACAF traced the maintenance shortcomings to several causes, including poor logistical support, insufficient preventive maintenance, a lack of participation by USAF technicians, and inadequate air conditioning, all of which hampered the Vietnamese who were responsible for maintenance.

(S) USAF Logistical Support to the South Vietnamese. In their report, the September 1972 PACAF survey team plainly stated that the South Vietnamese Air Force (VNAF) was "not receiving the logistical support required to maintain fully operational systems."[87] Compounding the logistics problem was the common practice of relying on the Vietnamese postal system to transport vital parts from Bien Hoa Air Base to Monkey Mountain; long delays and frequent losses were common when the Vietnamese mails were used.[88] Furthermore, the scarcity of parts led to the cannibalization of the two maintenance scopes in order to repair the scopes in the operations darkroom, which in turn

prevented "the VNAF from having adequate facilities in the tower for alignments and maintenance...."[89]

(S) Preventive Maintenance. Insufficient preventive maintenance was another factor contributing to the radar repair problem. Although six hours downtime per month was normally allocated for preventive maintenance, only 2.8 hours per month were actually allowed for the period June-September 1972. Complicating the preventive maintenance picture was the single shift maintenance concept of the VNAF. Under the single shift plan, a full complement of VNAF personnel was available during the day, but only a minimum number at night. Since very heavy air traffic occurred between 6 A.M. and 6 P.M., mission requirements often caused scheduled downtime to be cancelled, and this tended to discourage the Vietnamese.[90]

(S) Degree of Involvement by USAF Technicians. A third cause of the radar maintenance problem was the lack of direct participation by Air Force technicians. Agreements with the VNAF were misinterpreted by the USAF, and as a result, USAF maintenance personnel entered the picture only when invited by the VNAF. The failure to regularly augment VNAF work crews with skilled Americans worsened maintenance difficulties.[91]

(S) Air Conditioning at Panama. The fourth cause of the radar maintenance problem was inadequate cooling of the radar equipment. Poor air conditioning aggravated the radar maintenance problem, as was noted by the September 1972 PACAF survey team:

> ...the level of heat [had] an adverse effect on electronic equipment. The radar scope cabinets were almost too hot to touch; such a condition decreases the life of many electronic components and directly increases maintenance requirements and equipment outages.[92]

(S) The radar sites in Thailand also encountered difficulties, most of which, according to a former commander of the 621st Tactical Control Squadron,* could be traced to the philosophy and procedures of the Royal Thai Air Force maintenance personnel. For example, he stated the Thais believed that if a piece of machinery was running, then it should be left alone. Preventive maintenance and equipment specifications were therefore often ignored, resulting in unnecessary breakdowns which would force the radar off the air. Nor did the Thais like to operate equipment at full power; they believed that running equipment at reduced power prolonged its life. However, the operation of electrical machinery at less than full voltage causes burn-outs.[93]

Personnel (U)

(S) Manning. During the three-year lull in the air war that followed the March 1968 bombing halt, manning cuts were made at the TACCNS.[94] Late in the fall of 1971, however, North Vietnamese MiGs began to make aggressive penetrations into Laos; then, a major North Vietnamese ground offensive was launched in the spring of 1972 necessitating an abrupt increase in American air operations. Unfortunately, as the air war intensified, there was no corresponding increase in critical specialty code authorizations at Panama. Consequently,

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*(S) The 621st, headquarters at Udorn RTAFB, had responsibility for all USAF tactical control units in Thailand.

Panama operations crews were placed on an 84-hour work week.[95] The severe shortage of personnel, coupled with the 100° room temperatures caused by insufficient cooling, "resulted in a decrease in operational effectiveness/efficiency and generated a hazardous situation with regard to the control/monitor of tactical aircraft."[96]

(S) Security Classifications. Further impairing operations at the TACC-NS was the deficient security classifications of some of the personnel assigned to alleviate the manning shortages just cited. In other words, although assignments were made by the Military Personnel Center to fill crucially vacant slots, the incoming airmen and officers would sometimes possess security clearances which were lower than required.* In such cases, the new personnel were precluded from working in their assigned specialties for a month or more after arriving on station because their clearances needed upgrading.[97]

(U) The TDS Interface was a revolutionary concept, so the growth pains it experienced during its maturation were not unusual. Difficulties with communications, maintenance, and personnel, etc., were serious at times, but the "can do" attitude of everyone involved was evidently enough to prevent any one problem from crippling the system. The result was a reliable network of complementary tactical data sources and tactical control facilities which significantly enhanced the air war in Southeast Asia. The exact extent of the contribution of the TDS Interface will be explored in detail in the next chapter.

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*(C) Nearly all TACC-NS personnel were regularly exposed to Top Secret material, and the controllers had access to Special Intelligence data.

CHAPTER V

IMPACT OF THE TDS INTERFACE ON AIR OPERATIONS IN SOUTHEAST ASIA (U)

(S) The contributions of the TDS Interface to the air war in SEA were both numerous and meaningful. The diversity of roles in which the Interface was involved can best be appreciated by an enumeration of its more important uses. This chapter will therefore explore how the Interface enhanced eight particular areas: the removal of low speed aircraft from MiG-threatened air corridors, the review of important air incidents through the replay capabilities of the GSA-51 computer, joint fire control, the reconnaissance drone program, close air support, Search and Rescue, air-to-air MiG engagements, and the issuance of PRC border warnings.

Protection of Low Speed Aircraft (U)

(S) The wealth of data flowing into the Monkey Mountain computers enabled the TACC-NS to detect and monitor unknown tracks, thus permitting the withdrawal of slow-moving aircraft from potentially hostile flight paths. Radio relay and College Eye aircraft were especially aided by this service. Of course, compared to a Mach 2 MiG,[98] even a 500kt B-52 is a relatively slow mover. When a Mig-21 attempted an intercept against a B-52 during an Arc Light mission on 4 October 1971, the TACC-NS Battle Commander diverted the B-52 cell thereby avoiding a potential loss.[99] Review of the Battle Commander's Logs from January 1972 through January 1973 revealed nearly one occasion each week where

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the TACC-NS removed a low speed plane from an area threatened by an approaching MiG. Thus, in this manner, the TACC-NS was beneficial in protecting slow-moving American aircraft.

Replays (U)

(TS) The TACC-NS Commander's Logs also contain numerous references to the GSA-51 replay capabilities, which proved very useful in reviewing three particular types of air incidents. First, track replays were employed to locate the probable positions of downed aircrews, especially when no visual sighting was available. Second, replays were used to study the flightpaths of suspected PRC border violators; a computer playback could verify conclusively whether an American plane had or had not penetrated PRC airspace. This enabled the Joint Chiefs of Staff to reply with certainty to any White House inquiries which may have emanated from sensitive diplomatic channels.[100] The third advantage of the GSA-51 was its ability to reconstruct unusual tactical situations, from which lessons could be learned for future applications. For example, an engagement was examined on 13 November 1972 which involved two B-52s, one F-4, two MiGs, and two surface-to-air missiles.[101] Senior officers could closely study the enemy's tactics by reviewing such air encounters, and thereby be better prepared to formulate effective reaction measures. Thus each of the replay uses -- downed crew locations, PRC border checks, and combat track reconstructions -- played a vital mission role.

Joint Fire Control (U)

(S) The TDS Interface simplified coordination between the Air Force

and the Navy, thus improving performance in numerous operational areas, one of which was joint fire control. During the SEA conflict, hundreds of USAF planes were operating in a confined area with dozens of US Navy ships, all of which were equipped with sophisticated anti-aircraft weaponry. This situation created a pressing need for continuous coordination between the Navy and the TACC-NS on all firings of missiles or deckguns by ships in the Gulf of Tonkin. The close coordination which was effected through the TDS Interface yielded positive dividends to both services. For example, there were no reports of Air Force aircraft losses to Navy missiles, despite numerous Navy launches against MiGs. Furthermore, effective Navy-Air Force coordination on 24 May 1968 was credited with saving an Air Force reconnaissance drone from being shot down by Navy missiles. And in June 1968, the Navy refrained from launching a missile against a known hostile aircraft because a friendly plane was in the hostile's immediate vicinity.[102] This is not to say that the Navy was precluded from employing their anti-aircraft defenses. In fact, on several occasions Navy missiles successfully destroyed MiGs, as on 23 May 1968,[103] 19 April 1972, and 9 May 1972.[104] The Navy was simply required to confirm with the TACC-NS that no friendlies were in the area before a hostile aircraft could be engaged.[105]

Drones (U)

(S) The Air Force reconnaissance drone operation was a high priority program whose effectiveness was definitely increased by the resources available through the TDS Interface. Drone operations, codenamed

Buffalo Hunter in 1970, [106] played a vital role in providing intelligence information to the command staff in SEA.[107] General Vogt felt that the drones made an indispensable contribution to Linebacker II:

> I know of no other way we could have obtained the information we needed ... [during] the intensive combat activity of the December period.[108]

(S) Red Crown's MiG warning capabilities were employed to reduce the losses of drones to MiGs over NVN. The drone's recovery control officer, who operated the drone from a C-130 mother ship,[109] could evade attacking MiGs if he knew the drone was being threatened. Evasive maneuvers included jinking,* increasing speed, and flying in clouds. But the drone's airborne control officer had to know the altitudes of the cloud decks and be aware that the drone was being threatneed by MiGs. Red Crown provided this crucial information to the Air Force, thus helping to save numerous drones over NVN.[110] Red Crown's radar did not track the drone, because the drone was so small that it was essentially "unseeable" by radar.[111] But the MiG warnings and weather data supplied by Red Crown enabled the drone's recovery control officer to successfully evade the MiGs in most instances. In fact, at one time the North Vietnamese had 19 MiGs trying to shoot down a drone, and during another Buffalo Hunter mission a North Vietnamese wingman shot down his lead MiG 21 while trying to bag a drone![112]

Close Air Support (U)

(S) The TDS Interface was also occasionally involved in the close air support mission of US aircraft; that is, Motel was sometimes used to

*(U) Jinking is the rapid changing of the lateral or horizontal vector of an air vehicle.

expedite urgent requests for close air support. Such an instance occurred in September 1972, when Motel was instrumental in the successful defense of the South Vietnamese Army outpost of Mo Duc near Chu Lai. Mo Duc was being defended by 120 South Vietnamese and 40 Americans when on the night of 16 September the post was besieged by over 3,000 North Vietnamese regulars. Because of radio problems, Air Force forward air controllers (FACs) had contact with only the senior American ground advisor and the Panama CRC. Panama diverted two USAF F-4s to Mo Duc, but the on-site FACs had asked for 10 fighters plus gunships. Blue Chip was unable to provide either gunships or additional TACAIR on short notice. Consequently, the TACC-NS Battle Commander contacted the Navy and requested TACAIR, which was provided by six A-7s. Naval ships also supplied gunfire. Before the arrival of the A-7s, a third Air Force F-4 (a fast FAC) was diverted to Mo Duc and expended all of his ordnance against the enemy. The A-7s then arrived and delivered the armament the FACs had requested. The USAF FACs directed strikes against the enemy, and although one FAC was downed during the battle, the array of USAF and USN firepower turned the tide of the battle. The North Vietnamese were forced to retreat, carrying many of their dead but leaving 267 bodies in the perimeter fencing. The TDS Interface had thus been responsible for coordinating an unusually effective employment of airpower from two services, possibly saving the lives of 120 allies and 40 Americans.[113]

Search and Rescue (U)

(S) The TDS Interface network also made a significant contribution

to the Search and Rescue (SAR) effort in Southeast Asia. For example, the radio relay aircraft enhanced the SAR mission by relaying hundreds of rescue transmissions each month.[114] And the TACC-NS, with its powerful Panama radar, often furnished the initial notification to the USAF SAR forces that an American plane was down. Equally important was the Navy's radar net in the northern Gulf of Tonkin, for it provided the only continuous radar coverage of friendly forces over North Vietnam's Red River Delta, which included the Hanoi-Haiphong areas (see figure 6). Most of the Air Force and Navy pilots rescued from the Red River Delta coastal areas would probably never have been picked-up without the aid of the Navy's radar tracking facilities, for which Red Crown served as the focal point.[115]

(S) Both the Navy and the Air Force operated rescue units in SEA, and the TACC-NS served as a valuable link for regular SAR coordination. In addition to the Navy SAR forces which serviced the immediate coastline of NVN, three SAR ships provided rescue support to pilots downed over the Gulf of Tonkin.[116] The examples below illustrate the benefits which accrued to both services from their coordination through the TDS Interface. What follows is by no means a complete list; it is merely representative of the comments in Air Force records which testify to the valuable SAR role played by the TDS Interface.

1. (S) In February 1969 Panama vectored an Air Force Jolly Green (JG) rescue helicopter to a downed Navy A-4 pilot who had been involved in a mid-air collision. The pilot was saved.[117]

2. (S) In May 1969 Panama control directed a Jolly Green to a

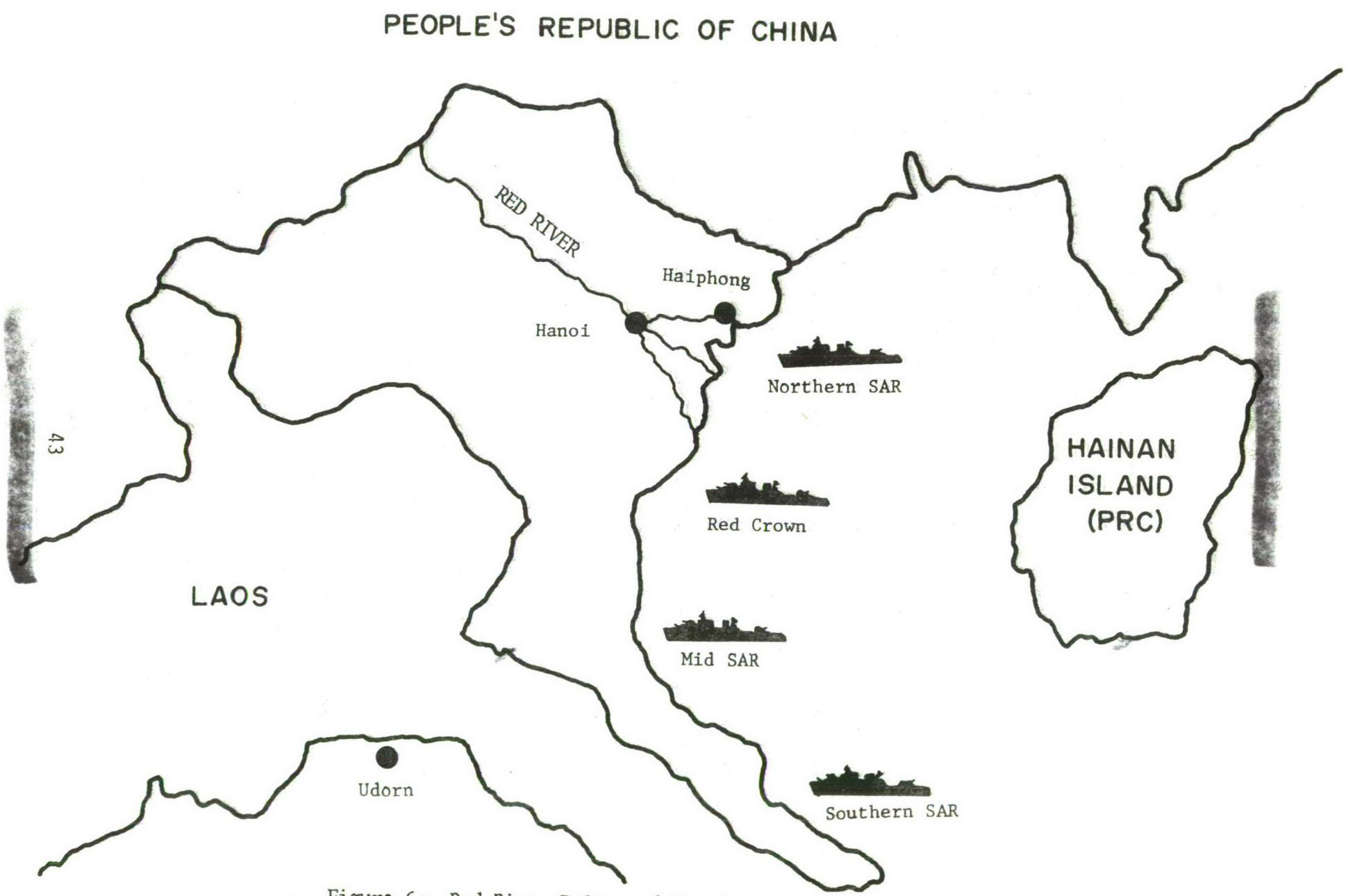

Figure 6: Red River Delta and Naval SAR Forces in the Gulf of Tonkin

Marine F-4 crew down at sea. The two crewmembers were in the water only 10 minutes before they were picked up.[118]

3. (S) On numerous occasions, part of the Interface was singled out in Air Force reports for its unusually vital role in specific SAR missions. For example, an F-100 crew was saved by a JG in January 1970, and the SAR aircraft commander specifically mentioned that the contribution of the Panama controller "was indispensable to this mission."[119] In another mission narrative by a JG aircraft commander, effective communications and exceptional coordination of fast mover resources through Panama were highlighted as enhancing the successful Air Force rescue of a Navy pilot in April 1971.[120] Finally, specific mention of the valuable contribution of the TACC-NS was made in a USAF report on a Jolly Green's saving of a Navy A-7 pilot in July 1972. The USAF Rescue and Coordination Center was advised of the Navy loss by the TACC-NS, and it was noted that, "Motel provided the primary relay of information from the SAR area to ... [the] Rescue and Coordination Center for this mission."[121]

4. (S) The Navy and Air Force often worked together on SAR missions. For example, an Air Force F-105 and F-4 went down north of the Demilitarized Zone in February 1972, but the exact aircraft positions were unknown. The SAR Airborne Command and Control Center asked the TACC-NS to provide the last known positions of the lost aircraft and to request Navy assistance for the mission. As a result of Motel's request, the Navy launched a helicopter and fighters to enhance the SAR effort.[122] Another example of a joint Navy-Air Force SAR mission was a September 1972 attempt to rescue the crew of an Air Force F-4. The

Rescue and Coordination Center received its initial notification from the TACC-NS, and six Navy fighter sorties were obtained to support the SAR mission.[123]

5. (S) Although neither of the missions discussed in the foregoing paragraph were credited with saves, a coordinated rescue attempt in May 1972 had positive results. The incident involved two USAF crewmembers whose F-4 went down in the ocean off Da Nang, South Vietnam. Panama reported the ejection of the crew, which was then picked up by the Navy's southern SAR ship, the USS Impervious.[124] A second illustration of a successful joint rescue venture was an August 1972 recovery of a Navy A-7 pilot. The Navy launched SAR forces into North Vietnam, but after the mission was well underway "Motel advised [that] the Navy was experiencing some difficulty and [had] requested support."[125] Subsequently, the USAF 40th Aerial Rescue and Recovery Squadron provided the desired assistance, and the pilot was saved.[126]

6. (U) Air Force-Navy SAR cooperation was also beneficial in noncombat missions. A dramatic example was the Air Force role in the medical evacuation of eight sailors who had been critically injured during an aircraft landing accident on the USS Midway. At 1345Z on 24 October 1972 Panama advised Air Force SAR forces that the USS Midway, which was 100 miles offshore, needed JG assistance for its injured sailors. Within two hours a JG with an AF physician began onloading eight patients, and the physician stated that the JG mission was directly responsible for saving all eight lives.[127]

7. (S) Perhaps one of the best examples of the enhancement of

SAR operations by successful coordination through the Interface was a mission on 5 November 1972, when two US Army helicopters were shot down near Da Nang Air Base. The Air Force effected the rescue, and the SAR Airborne Command and Control Center requested strike support for the mission. The Air Force had no strike aircraft in the area, thus Motel requested strike support from the Navy which then diverted four of its A-7s to the rescue scene. Panama monitored the Navy fighters and the recovery while the Air Force Jolly Greens picked up four survivors.[128]

(S) Even with the improved communications provided through the TDS Interface, coordination between the Air Force and the Navy occasionally faltered. For example, during the early manual phase of the Interface operation on Air Force reconnaissance drone was shot down by Navy pilots who mistook the drone for a MiG.[129] Another unfortunate incident occurred on 23 October 1972. Air Force planes accidentally flew through a restricted Naval gunfire area, causing the Navy to cease firing and thus temporarily exposing the USS Reprisal to hostile shore batteries.[130] These two examples, however, were the rare exceptions. On the whole, the TDS Interface provided an effective coordination channel through which allied efforts were regularly enhanced in joint fire control, the reconnaissance drone program, pressing close air support requests, and Search and Rescue operations.

MiG Engagements (U)

(S) One of the most significant contributions of the Interface was its role in air-to-air combat, since the extensive warning and control facilities available through the TDS Interface enhanced the MiG-kill

capabilities of US fighters. Although Mig encounters became less frequent after President Johnson's bombing halt in the spring of 1968, the resurgence of MiG activity late in 1971 focused on the value of friendly radar coverage, as evidenced by the following extract from a Seventh Air Force message to CINCPACAF:

> Recent MiG incursions into Laos and subsequent attempted engagement of USAF aircraft reveal a need for extended low level surveillance, continuous control capability, and threat warnings over Laos and portions of North Vietnam.[131]

(S) Despite its limitations, the radar protection afforded by Red Crown was often a crucial factor when American planes battled MiGs over NVN. The MiG warnings broadcast by Red Crown often enabled US pilots to maneuver themselves into more favorable positions for pending engagements. Thus, the information provided by Red Crown furthered the air-to-air mission of US fighters, as attested by numerous references in Air Force files. For example, on 8 May 1972, Oyster 01, an Air Force F-4, scored a kill on a MiG 21 after being vectored by Red Crown.[132] Another example was one of the last dogfights of the war, in which an Air Force F-4 downed a MiG on 7 January 1973. After receiving a vector from Red Crown, the F-4 pilot reported that he "was under Red Crown control, and a more accurate and timely intercept could not have been asked for."[133]

(S) The critical importance of the interface between the USAF and USN was demonstrated by an unusual series of USAF F-4 losses on 27 June 1972. On that day, Red Crown was unable to appear on station due to a typhoon in the Gulf of Tonkin and Disco became the only US control agency available.* Before the day was over, four USAF F-4s had been shot down,

*Recall that Teaball was not established until August 1972.

three by MiGs.[134]

(S) The first loss occurred when a strike aircraft was downed near Hanoi by a surface-to-air missile. Shortly thereafter a USAF Anti-MiG Combat Air Patrol aircraft was downed by a MiG after having received a last-minute warning from Disco. During the SAR effort which ensued, two more F-4s were downed by MiGs. MiG warnings were being issued only intermittently, and were not always being received due to radio interference and saturated communications frequencies. In all, four aircraft and eight crew members were downed. SAR forces faced heavy MiG reactions and ground fire, and were able to recover two of the downed crew members only because they refused to abandon the attempt.[135]

(S) The initial reaction of both Blue Chip and TACC-NS was to criticize the inadequate MiG warnings and control being provided by Disco. Accordingly, Disco was repeatedly advised to move farther north to increase coverage of the target area.[136] In point of fact, however, Disco had moved as far north as possible, and during the latter stages of the SAR effort was actually within North Vietnamese airspace without any Barrier Combat Air Patrol*. The control problem of 27 June was therefore not the result of Disco's orbit position, but was rather a reflection of the limitations and inadequacy of Disco's equipment. As a supplementary source of warning and control Disco was valuable, but the degree of control and warning normally provided by Red Crown was simply not available through Disco alone. Weather conditions and radio magnetic interference only served to further degrade Disco's capabilities and magnify its limitations.[137]

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*(U) The USN equivalent of MiG Combat Air Patrol.

(S) The events of 27 June graphically illustrated the importance of the Interface to USAF pilots involved in air-to-air combat. The non-availability of the Navy's radar coverage on 27 June 1972 contributed to the heavy F-4 losses of that day, thereby highlighting the need for reliable radar protection. As with all of the operational areas reviewed thus far in this section, the TDS Interface furthered the Air Force mission by providing critical information which would otherwise have been unavailable.

PRC Border Warnings (U)

(S) One of the original purposes of the TDS Interface was to prevent American overflights of PRC airspace, and this mission was fulfilled superbly. American warplanes were kept away from the PRC border by the warnings issued by Red Crown and the TACC-NS. From July 1969 to June 1970 an average of 3.5 PRC border warnings were relayed each month, while from July 1970 to July 1971 a monthly average of 2.8 warnings were broadcasted.[138] The reduction in border warnings resulted from the decreases in sortie levels between 1969 and 1971.[139]

(TS) Although sortie levels kept declining after 1970, concern in Washington over the possible ramifications of airspace violations remained intense. In the fall of 1970, an American military plane inadvertently landed in the Soviet Union and a US helicopter flew over Czechoslovakia, thus renewing fears of a similar occurrence in Southeast Asia. Consequently, CINCPACAF stressed to Seventh Air Force that, "our procedures for controlling flights near sensitive areas [must] provide

us all possible assurances" against another incident.[140]

(U) After the 1972 North Vietnamese spring offensive, the border-monitoring mission was again thrust to the forefront, with the Interface issuing a monthly average of four PRC border warnings between June and October 1972.[141] Furthermore, in July 1972 the Interface began employing more rigorous warning procedures[142] because the increase in PRC border allegations during Linebacker had, in the words of the Joint Chiefs of Staff, "aroused grave concern at [the] highest level."[143] In a message to CINCPAC, the Joint Chiefs said it was "imperative" that any aircraft approaching the PRC border be tracked on a real time basis, so that positive control could be maintained.[144] Once again, the Interface proved to be of immeasurable value.

CONCLUSION (U)

(S) The interfacing of the tactical data systems in Southeast Asia was not the result of a master plan developed during the first stage of the war; but rather, the linkage concept sprang from the serious problems which began to unfold in 1966. The foremost problem was the violation of PRC airspace by American warplanes. The Unites States naturally wanted to prevent any incident which might have precipitated a Korean-type intervention by the PRC into the Vietnam conflict. And in retrospect it now seems clear that another major American foreign policy goal was the avoidance of a rupture in the fragile ties which were evidently being nurtured with the mainland Chinese both before and after President Nixon's February 1972 visit to Peking.

(S) The TDS Interface was an unusually bold experiment undertaken on very short notice; nevertheless, the expansion of the Interface network by the addition of numerous subsystems between 1967 and 1969 proceeded smoothly. Moreover, the parochial interests of the Air Force and Navy did <u>not</u> hinder the tremendous coordination effort that was required in the planning and execution of the Interface operation. The overcoming of parochialism most likely stemmed from the emphasis originally placed on the Interface by the Joint Chiefs. Further, the continued concern of the Joint Chiefs over the potential political consequences of a serious border incident with the People's Republic of China was apparently one of the deciding factors which maintained the automated link through the wind-down of the war in 1969-1971.

(U) The TDS Interface proved to be a valuable asset when the air war intensified after the North Vietnamese spring offensive in 1972. As pointed out in Chapter V, the Interface had made a continuous contribution to numerous operational areas ever since its inception. With the intense out-country raids during Linebacker operations, the role of the Interface in PRC border warnings, MiG warnings, and SAR operations only increased and in fact proved indispensable. Despite its limitations, the TDS Interface made a major contribution to the US air effort against the North Vietnamese.

FOOTNOTES (U)

1. (TS) Rprt, Office of Air Force History, The Air Force Response to the Pueblo Crisis, Jan 68, pp 15-16. [CHECO Microfilm Roll TS-97, frame 035]

2. (U) Ltr, Col Wm Cloppas, Director of 7AF Automated Systems, to 7AF/DOA, Subj: Gen Gordon Blood's End of Tour Report, 9 Oct 68, pp 1-2. [CMR S-357, 042]

3. Ibid., pp 2-3.

4. Ibid., p 3.

5. (S) Rprt, SEA Office of the Mitre Corp, Background That Developed the TACC-NS: Facilities Report on the Seek Dawn System, 1 Jan 70, pp 1-2. (Hereafter cited as the Mitre Rprt). [CMR S-764, 188]

6. (TS) Rprt, 620th Tac Con Sq, Tactical Air Control Center-North Sector Historical Report, 1 Nov 67 - 31 Oct 68, p 2. (Hereafter cited as the TACC-NS Hist Rprt). [CMR TS-163, 115]

7. (TS) Rprt, 7AF, Requirement Study on Seek Dawn Automated TACC, Sep 70, Atch 14. (Hereafter cited as the 7AF S.D. Study). [CMR TS-97, frame 082]

8. (TS) TACC-NS Hist Rprt, p 1.

9. Ibid., p 5.

10. Ibid., p 4.

11. (S) Briefing, Monkey Mountain, 19 Jan 73, p 4. (Hereafter cited as M.M. Brfg). [CMR S-830, 070]

12. (TS) 7AF S.D. Study, Atchs 13 and 14.

13. (TS) 7AF S.D. Study, p 2 and atchs 13 and 14.

14. (S) TACC-NS Battle Commanders' Record Log, May 72 - Feb 73, pp 18, 26, 31, 32, 99, and 138. [CMR S-880, 115 et al.]

15. (TS) TACC-NS Hist Rprt, p 1.

16. Ibid., glossary, item 40.

17. Ibid., pp 5-6.

18. (S) M.M. Brfg, p 4.

19. (TS) 7AF S.D. Study, Atchs 13 and 14.

20. (S) Mitre Rprt, p 11.

21. (S) 7AF S.D. Study, p 2.

22. (S) Intvw, Capt Frank Machovec/CHECO with Capt Arthur D. Sikes, USAF Special Security Officer, 13th AF Advanced Echelon, Udorn RTAFB, 14 June 1973.

(S) Intvw, Capt Frank Machovec/CHECO with Lt Col Harvey D. Angel, Commander, 6924 Security Squadron, Ramasun Station, Thailand, 7 Dec 73.

23. (TS) TACC-NS Hist Rprt, p 20.

24. (S) Mitre Rprt, p 14.

25. (S) 7AF OPlan, Subj: Combat Lightning, 1 Feb 71, p 1. [CMR TS-211, 106]

26. (TS) 7AF S.D. Study, Atch 14.

27. Ibid., Atch 3.

28. (S) SEA Tactical Data Systems Operations Plan (OPLAN 586-70), 1 Feb 70, Appendix III - Annex B, pp 2-3. [CMR TS-163, 032]

29. (S) Brfg, Monkey Mountain Operations Center, 28 March 1972, p 13. [CMR S-764, 181]

30. Ibid.

(S) Rprt, Systems Development Corp, Naval Tactical Data System, 9 Apr 71, pp 25-28. (Hereafter cited as NTDS Rprt). [CMR S-764, 013]

31. (S) Brfg, Monkey Mountain Operations Center, 29 March 1972, p 13.

32. (S) Intvw, Capt Frank Machovec/CHECO with Capt Frank Herndon, Weapons Controller, 621st Tac Con Sq, Udorn RTAFB, 13 Oct 73.

33. (S) Ltr, Col Paul L. Park, CC, 505th Tac Con Gp, to 7AF/DO, Subj: Digitized Data From Invert to Panama, 27 Dec 71, p 1. (Hereafter cited as the Park Ltr). [CMR S-187, 087]

34. (S) Msg, Det 6 ASD, Tan Son Nhut, SVN, to L.G. Hanscom Fld, Mass., Subj: Engineering/Communications Study, 230705Z Apr 71, p 4. [CMR S-772, 023]

35. (S) Rprt, USAF Systems Command, A Preliminary Engineering/Communications Study for Installation of an FYQ-40 Common Digitizer in Southeast Asia, 14 May 71, pp 10-11. [CMR S-772, 022]

36. (S) Park Ltr, p 2.

37. (TS) 7AF S.D. Study, Atch 6.

38. (S) Msg, Brig Gen Richard G. Cross, 7AF/DO, to CINCPACAF, Subj: SEA TDS Interface, 040300Z May 72, p 3. [CMR TS-187, 092]

39. (S) Rprt, Systems Development Corp, Interface Operations I, 9 Apr 1971, p 16. [CMR S-764, 030]

40. (S) Project CHECO Report, The EC-121 Incident, 15 Apr 69, 15 Mar 70, p 6.

41. (TS) 7AF S.D. Study, Atch 6.

42. (TS) Ltr, Maj Gen Ernest C. Hardin, 7AF/Vice Cmdr, to MACV (J02), Subj: SEA TDS Interface Retention, 4 Sep 71, p 1. [CMR TS-97, 083]

43. (TS) 7AF S.D. Study, pp 3-4.

44. Ibid., p 1.

45. (S) Project CHECO Report, Air Defense in Southeast Asia 1945-1971, 17 Jan 73, p 24.

46. (TS) Staff Summary Sheet, 7AF/XPP to 7AF/DO et al., Subj: 7AF Seek Dawn Requirement Study, 9 Sep 70, p 1. [CMR TS-97, 086]

47. (TS) Msg, Comdg Gen, Third Marine Amphibious Force to COMUSMACV, Subj: SEA TDS Interface, 120841Z Oct 70, p 1. [CMR TS-97, 087]

48. (TS) Msg, Cmdr Carrier Task Force 77 to COMUSMACV, Subj: SEA TDS Interface, 121132Z Oct 70, p 2. [CMR TS-97, 086]

49. (TS) 7AF S.D. Study, p 3 and Atch 11.

50. (TS) 121132Z Oct 70.

51. Ibid., p 3.

52. (TS) Msg, COMUSMACV to CINCPACAF, Subj: SEA TDS Interface, 201155Z Oct 70, p 3. [CMR TS-95, 063]

53. (TS) Msg. 7AF to 7/13AF/DO, et al., Subj: Command and Control Seek Dawn Posture, 160015Z Nov 70, p 1. [CMR TS-97, 087]

54. (TS) M/G Hardin's Ltr, op. cit., p 1.

55. (TS) Staff Summary Sheet, Brig Gen Walter T. Galligan, 7AF/TACC, to 7AF/DO et al., Subj: SEA TDS Interface, 17 Jun 70, p 1. [CMR TS-95, 062]

56. (TS) Ltr, Director, Monkey Mountain Operations Center, to 7AF/DPLG, Subj: SEA TDS Interface, 25 Jul 70, p 2. [CMR TS-97, 084]

57. (TS) 7AF S.D. Study, p 3.

58. (TS) Staff Summary Sheet, 7AF/DOCPC to 7AF/DO, et al., Subj: Tactical Air Control Center-North Sector, 9 Jan 71, p 1. [CMR TS-188, 008]

59. Ibid.

60. (TS) Msg, COMUSMACV to CINCPAC, Subj: SEA TDS Interface, 181002Z Mar 72, p2]. [CMR TS-188, 011]

61. (TS) Staff Summary Sheet, 7AF/DOCPC to 7AF/DO, et al., Subj: TACC-NS, 9 Jan 71, p 1. [CMR TS-188, 008]

62. (S) Msg, 7/13AF Udorn RTAFB to 7AF Tan Son Nhut AB, Subj: Alternate TACC-NS, 300515Z May 72, pp 1-2. [CMR S-764, 200]

63. (S) Intvw, Mr. Melvin Porter/CHECO with General John W. Vogt, Commander 7AF, Nakhon Phanom RTAFB, 13 Sep 73, p 1. [CMR S-905, 011]

64. (S) Rprt, PACAF Southeast Asia Airspace Saturation: Report of Follow-up Visit, 20 Oct 72, p 14. (Hereafter cited as Follow-up Rprt). [CMR S-758, 020]

65. Ibid., p 14.

66. (S) NTDS Rprt, pp 26-27.

67. (S) Msg, CSAF to 7AF, Subj: Teaball Communications, 262238Z Oct 72, p 1 and p 3. [CMR TS-187, 154]

68. Ibid., p 2.

69. Ibid., p 3.

70. (S) Msg. 7AF/DO to CINCPACAF and CINCSAC, Subj: Communications Problem Between [Teaball] WCC and Luzon, 020345Z Jan 73, pp 3-4. [CMR TS-187, 196]

71. (S) Follow-Up Rprt, p 15 and p 20.

72. (S) Herndon Interview.

73. (S) Vogt Interview, p 1.

74. Ibid., p 2.

75. (TS) Project CHECO Report, Linebacker: Overview of the First 120 Days, 27 Sep 73, p 46.

76. Ibid.

77. (S) Follow-Up Rprt, p 1.

78. Ibid.

79. Ibid., p 10.

80. (S) TACC-NS Battle Commanders' Record Log, May 72 - Feb 73, 1110Z entry, pp 82-83. (Hereafter cited as B.C. Log). [CMR S-880, 125]

81. Ibid., p 88.

82. (S) Ltr, Col Wm H. Steward, 7AF/DOCC to 7AF/DOC, Subj: General Gordon Blood's End of Tour Rpt, 16 Oct 68, p 3. [CMR S-357, 068]

83. (TS) Msg, 7AF to CINCPACAF, Subj: Seek Dawn Requirement Study, 100500Z Nov 70, p 2. [CMR TS-97, 086]

84. (S) Qrtrly Hist, 620th Tac Control Sq, 1 Oct 71 - 31 Dec 71, p 5. [CMR S-759, 096]

85. (S) Follow-Up Rprt, p 14.

86. Ibid., p 25.

87. Ibid., p 27.

88. Ibid., p 27.

89. Ibid., p 27.

90. Ibid., pp 26-27.

91. Ibid., p 26.

92. Ibid., pp 28-29.

93. (S) Intvw, Maj William Lofgren/CHECO with Lt Col Roger Landreville, Commander, 621st Tac Con Sq, Udorn RTAFB, 26 Dec 73, p 20. [CMR S-905, 018]

94. (S) Intvw, Capt Frank Machovec/CHECO with Maj Merrill K. Kashiwabara, 621st Tac Con Sq (formerly a Battle Cmdr at the TACC-NS), 24 July 73, p 5. [CMR S-905, 014] (Hereafter cited as Kashiwabara Intvw).

95. (S) Follow-Up Rprt, p 14.

96. Ibid., p 14.

97. (S) Kashiwabara Intvw, p 7.

98. (S) Rprt, 7AF Intell, Subj: Communist Air Defense Equipment in SEA, Feb 72, p 27. [CMR S-871, 172]

99. (S) Qrtrly Hist, 620th Tac Con Sq, 1 Oct 71 - 31 Dec 71, p 4. [CMR S-759, 096]

100. (TS) Msg, JCS to CINCPAC, 112047Z July 72, pp 3-5. [CMR TS-188, 072]

101. (S) B.C. Log, 1530Z and 1814Z entries, p 225.

102. (S) TACC-NS Hist Rprt, pp 18-19.

103. Ibid., p v.

104. (U) Rprt, US Navy 7th Fleet Coordination Group, US Seventh Fleet Chronology, pp 3 and 5. [CMR TS-213, 170]

105. (S) TACC-NS Hist Rprt, p 18.

106. (S) Project CHECO Report, Buffalo Hunter, 24 July 73, p xi.

107. Ibid., p 36.

108. Ibid., p 37.

109. Ibid., p 6.

110. (S) Intvw, Maj Paul Elder/CHECO with Lt Col John A. Dale, Buffalo Hunter Operations Officer, U-Tapao Afld, 24 Dec 72, p 1. [CMR S-897, 077]

111. Ibid., p 3.

112. Ibid., p 2.

113. (S) Qrtrly Hist, 620th Tac Con Sq, 1 July 72 - 30 Sep 72, pp 6-7. [CMR S-759, 126]

114. (TS) Staff Summary Sheet, B/G Walter T. Galligan to 7AF/DO et al., Subj: SEA TDS Interface, 18 Dec 72, Atch 3. [CMR TS-95, 064]

115. (S) Kashiwabara Intvw, p 9.

(TS) Memorandum, Sect'y of the AF to the Deputy Sect'y of Defense, 3 Dec 70, p 5. [CMR TS-95, 071]

(S) CHECO Intvw with Brig Gen Richard G. Cross, 7AF/DO, 18 Dec 72, p 12. [CMR S-899, 165]

116. (S) NTDS Rprt, p 2.

117. (S) Qrtrly Hist, 37th ARRSq, Jan-Mar 69, p 21. [CMR S-376, 105]

118. (S) Qrtrly Hist, 39th ARRSq, Jul-Sep 69, p 94. [CMR S-376, 155]

119. (S) Qrtrly Hist, 39th ARRSq, Jan-Mar 70, pp 68 and 70. [CMR S-376, 192]

120. (S) SAR Mission Narrative, Maj Ronald Soroka, Aircraft Commander, 20 Apr 71, p 3. [CMR S-872, 016]

121. (C) Msg, 40th ARRSq Rescue and Coordination Center to AIG 7940, Subj: Rescue, 172127Z July 72, pp 2-3. [CMR S-724, 030]

122. (S) SAR Mission Narrative, Maj Bruce Driscoll, Aircraft Commander, 17 Feb 72, p 1. [CMR S-872,072]

123. (S) Msg, 40th ARRSq to AIG 7940, Subj: Rescue, 132231Z Sep 72, pp 1 and 3. [CMR S-973, 177]

124. (C) Msg, 3rd ARRSq/OL-A to CSAF, et al., Subj: Rescue, 062015Z Aug 72, p 5. [CMR S-873, 167]

125. (S) Msg, 40th ARRSq to AIG 7940, Subj: Rescue, 062015Z Aug 72, p 5. [CMR S-873, 167]

126. Ibid., pp 1 and 5.

127. (U) Msg, 40th ARRSq to AIG 7940, Subj: Rescue, 242015Z Oct 72, pp 2-3. [CMR S-724, 011]

128. (S) B.C. Log, 0240Z entry, p 217.

129. (S) Project CHECO Report, Buffalo Hunter, p 26; also, Ltr, 100 Strat Recon Wg to CHECO, 1 Nov 73, p 1. [CMR S-905, 021]

130. (S) B.C. Log, 0630Z entry, p 199.

131. (S) Msg, 7AF to CINCPACAF, Subj: College Eye/Rivet Gym, 190400Z Dec 71, pp 2-3. [CMR S-816, 011]

132. (S) Summary of Mig Engagements, 7AF, Oyster Flight of the 432nd Tac Recon Wg, 8 May 72, p 5. [CMR TS-180, 200]

133. (S) Msg, 620th Tac Con Sq to AIG 7937, Subj: Mig Engagement, 072133Z Jan 73, p 1. [CMR S-832, 131]

134. (S) B.C. Log, p 77.

135. Ibid., pp 78-79.

(S) Summary of Mig Engagements, 7AF, Troy Flight of the 432nd Tac Recon Wg, 27 Jun 72, p 51. [CMR TS-181, 130]

(S) Rpt, PACAF, Summary of Air Operations in SEA, June 72, p 5-A-2. [CMR S-759, 177]

(S) Ltr, 552d AEW&C Wg, Det 1, to Project CHECO, Udorn, Subj: "Linebacker Mission 27 Jun 72," 10 May 74.

136. (S) B.C. Log, pp. 77-79.

137. (S) Linebacker Mission, 27 Jun 72.

138. (TS) 7AF S.D. Study, Atch 8.

139. Ibid., p 3.

140. (TS) Msg, CINCPACAF to 7AF et al., Subj: Control Procedures for Flights Near Sensitive Borders, 252355Z Nov 72. [CMR TS-95, 067]

141. (S) B.C. Log, pp 56-187. Also, Warning Logs of the TACC-NS, Aug-Oct 1972. [CMR S-764, frames 154-169]

142. (TS) Msg, 7AF to CINCPACAF et al., Subj: Chinese Buffer Zone and Alleged Border Violations, 140345Z July 72, pp 1-4. [CMR TS-188, 072]

143. (TS) Msg, JCS to CINCPAC, Subj: Chinese Buffer Zone, 112047Z July 72, p 3. [CMR TS-188, 071]

144. Ibid., pp 3-4.

GLOSSARY OF ACRONYMS AND KEY TDS INTERFACE CALL SIGNS (U)

AIG	Address Indicator Group
ADVON	Advanced Echelon
ARRSq	Aerial Rescue and Recovery Squadron
BARCAP	Barrier Combat Air Patrol
Blue Chip	Call sign of the 7AF Tactical Air Control Center located at Tan Son Nhut Air Base, South Vietnam, and later moved to Nakhon Phanom RTAFB, Thailand
Brigham	Call sign of the CRC located at Udorn RTAFB.
CHECO	Contemporary Historical Examination of Current Operations
CINCPAC	Commander-in-Chief, Pacific Command
CMR	CHECO Microfilm Roll
COMUSMACV	Commander, United States Military Assistance Command, Vietnam
CRC	Control and Reporting Center
CRP	Control and Reporting Post
CSAF	Chief of Staff of the Air Force
Disco	Call sign of the College Eye (EC-121) aircraft
DO	Director of Operations
FAC	Forward Air Controller
HQ	Headquarters
IBM	International Business Machine Corporation
JG	Jolly Green (Rescue Helicopter)
Luzon	(S) Call sign of the KC-135 radio relay aircraft
MIGCAP	Mig Combat Air Patrol
Motel	Call Sign of the TACC-NS
NVN	North Vietnam
OPlan	Operations Plan
OPREP	Operations Report
PACAF	Pacific Air Forces
Panama	Call sign of the CRC at Monkey Mountain
PRC	People's Republic of China
Red Crown	Call sign of the Navy's net control station ship in the northern Gulf of Tonkin

RTAFB	Royal Thai Air Force Base
SAR	Search and Rescue
SEA	Southeast Asia
SVN	South Vietnam
TACAIR	Tactical Air
TACC-NS	Tactical Air Control Center - North Sector
Teaball	Call sign of the weapons control center at Nakhon Phanom RTAFB
TDS	Tactical Data System
TOT	Time Over Target
USAFSS	United States Air Force Security Service
USN	United States Navy
VNAF	South Vietnamese Air Force